



## Wind Power Purchasing Strategy

- Purchase from third party supplier in area if state laws permit
- Purchase from utility company supplier if third party not allowed
- Power purchase if possible (tags if not possible) without a premium

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## Wind Power Purchasing Strategy

- Regional areas (19)
- Aggregated DoD (Air Force, Army, Navy, Marine Corps) facilities load in territory
- Centralized contracting activity aggregates loads
  - Power Marketing Agency (WAPA, BPA, TVA)
  - Aggregator (DESC, GSA)

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## Wind Power Purchasing Strategy (con't)

- DoD Facility or Major Command (MAJCOM, IMA, EFD)
- Account for any legal state and other regulatory barriers
- Account for future DoD renewable (wind, geothermal, solar) development on or near DoD installations

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## Wind Power Purchasing Contracts

- Full and Open Competition
- Power Purchase Agreement for full power requirements
- Long term (5 to 10 years)

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## Wind Power Purchasing Contracts (con't)

- Shaped product to match installation profile
- Delivery of shaped product by supplier or Power Marketing Agency
- Fixed price of shaped product
  - Below expected wholesale power price over contract period
  - Includes all transmission cost
  - Includes all balancing charges and penalties

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## Wind Power Purchasing Contracts (con't)

- Contract Award Procedure
  - RFI – Request for Information
  - RFP – Request for Proposals
  - DoD RFP Evaluation Team
  - Website – [www.fedbizops.gov](http://www.fedbizops.gov)

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## Wind Power Purchasing Regions

1. NV & NM – 70 MW
2. BPA Direct Served Customers – 40 mw
3. BPA Service Area – 150 mw
4. WAPA Central Valley Customers – 55 mw
5. WAPA Non-Central Valley Customers – 210 mw

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## Wind Power Purchasing Regions (con't)

6. WAPA Service Area – 500 mw
7. PJM Service Area (PA, NJ, MD, DC) – 260 mw
8. Heartland Area (KS, MO, OK) – 60 mw
9. TX – 180 mw
10. TVA Service Area (Parts of TN, KY, GA, MS, AL) – 75 mw

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## Wind Power Purchasing Regions (con't)

11. KY & WV – 21 mw
12. Northeastern Area (NY, CT, RI, NH, VT ME) – 10 mw
13. VA – 200 mw
14. Upper Heartland Area (MI, IL, IN, OH, IA, MN, WI) – 120 mw
15. Upper MISO Area

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## Wind Power Purchasing Regions (con't)

16. NC & SC
17. AR & LA – 10 mw
18. Southern Company Service Area (AL, GA, MS, FL Panhandle) – 300 mw
19. FL – 90 mw

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## Air Force Wind Power Purchasing Contracts

Base	Term	Annual Quantity	Product/Price	Comment
1. Cannon	FY 02-06	1.2 Gwh	Generation/Premium	0% of load
2. Davis	FY 02-04	76 Gwh	Generation/Premium	100% of load
3. Edwards	FY 01-05	132 Gwh	Generation/Competitive	60% of load, ramp up to 100% renewable in 3rd year
4. Grand Forks	FY 02-06	18 Gwh	Tag/Premium	2.6% of load
5. Schriever	FY 02-06	18 Gwh	Generation/Premium	7.5% of load
6. Sheppard	FY 01-05	63 Gwh	Generation/Premium	5% of load
7. F. B. Warren	FY 02-06	22 Gwh	Tag/Premium	15.5% of load
8. Minot	FY 02-06	40 Gwh	Generation/Premium	2% of load
9. Langhlin	FY 03-05	4.2 Gwh	Generation/Premium	10% of load
10. Goodfellow	FY 03-04	2.1 Gwh	Generation/Premium	5% of load
11. Lackland	FY 02-06	1.6 Gwh	Generation/Premium	4.2% of load
12. Ellsworth	FY 02-06	2.2 Gwh	Tag/Premium	3% of load; Rosebud Tribe Generation
13. Fairchild	FY 02-06	7.8 Gwh	Generation/Premium	10% of load
		256 Gwh		

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## Wind Energy Options on Your Land



August 2003  
Orlando, FL

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## Outline



- Global Energy Concepts
- Wind Energy Technology
- Site Assessment
- Data Collection
- Feasibility Analysis
- DOD Wind Energy Assessment

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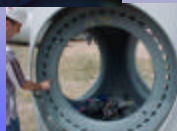
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## Global Energy Concepts

- Largest U.S.-based wind energy consultancy
- 20 Employees
- 16 years of experience as investors' engineers
- Wind resource assessment, site selection, technical due diligence, construction oversight, operations monitoring
- Experience in 25 countries



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## Large-Scale Wind Turbines

- 660 kW to 1.8 MW
- Hub Heights: 213 ft to 262 ft
- Rotor Diameters: 154 ft to 262 ft
- Max Tip Heights: 290 ft to 370 ft
- Commercial plant size: 20 to 300 MW
- Number of 1.5 MW turbines: 13 to 200
- Wind Speeds: greater than 15.5 mph (annual average basis) – 17 mph more typical



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## Industrial-Scale Wind Turbines

- 50 kW to 250 kW each
- Hub Heights: 80 to 131 ft
- Rotor Diameters: 50 to 100 ft
- Tip Heights: 100 to 180 ft
- Small number of turbines used (1 – 6?)
- Energy may offset higher cost grid power
- Utility might purchase excess power
- Wind Speeds: approx. 15 mph but depends on economic analysis



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## Residential-Scale Wind Turbines

- 400 watts to 50 kW
- 20- to 120-foot towers
- Remote power
- Combine with solar for battery charging
- Grid-tie could offset higher electricity from utility
- May be feasible at lower wind speed site
- Wind Speeds: 8-10 mph or greater, depends upon economics



Pictures from Bergey Windpower and Southwest Wind Power

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## Typical Development Process

- First Pass Analysis – Is Wind Worth Investigating?
- Site Evaluation and Wind Resource Assessment
- Feasibility Studies and Economic Analyses
- Equipment Selection and Procurement
- Project Design and Construction
- Operation and Maintenance

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## Site Assessment

- Wind – existing measurements?
- Land – quantity, complexity, usage, access, orientation, buildings
- Transmission – voltage, capacity, distance, system impact
- Environmental – sensitive flora and fauna, visual impacts, sound, cultural resources
- Power Purchase Contracts – rate schedules
- Air Space – aviation and communication
- Policies – State or local incentives

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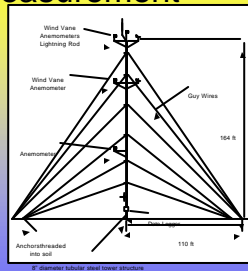
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## Wind Measurement

- Meteorological Towers
  - 164 ft tall
  - 8-inch diameter
  - Guyed pole structure (not climbable)
  - No Foundation
  - Anchors threaded into soil
- Wind speed and direction at multiple heights
- One day to install
- Operate for 1 year (minimum)
- Data collection via cellular phone
- Not economical for residential-scale development



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## Wind is Highly Variable



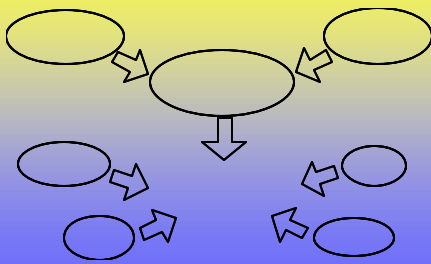
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## Project Wind Speed Analysis



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## Feasibility Analysis

- Scope depends on development options
- Project size and equipment options
- Energy production estimates (gross and net) from wind data and assumptions
- Environmental and cultural considerations
- Project costs, funding sources, evaluation criteria
- Cost of energy
- Power Purchase and Interconnect Agreements

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## Residential-Scale Turbine Analysis

- Estimate range of turbine production using existing local wind measurements.
- Evaluate local utility rules and rates associated with load-side generation.
- Evaluate load patterns.
- Calculate range of buy-back periods (years) for various equipment options and wind speeds.
- Acceptable buy-back period? 5 to 10 years

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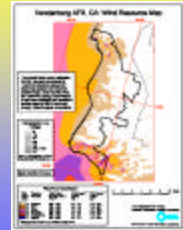
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## On-Base Wind Energy Assessment

- Assessment Process
  - Over 900 installations from DOD Real Property Inventory
  - Multiple screening criteria
    - Base size (> 1000 acres)
    - Quantity of windy land (Class 3,4,5,+)
    - Proximity to transmission
    - Local electricity costs
    - State policies
    - Market potential
  - NREL performed GIS analysis using high resolution wind maps
  - Established short list



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## On-Base Wind Energy Assessment

- Short List and Top Prospects
  - 75 Installations identified as meeting screening criteria
  - Ranked and prioritized short list to identify top prospects
  - Services helped coordinate base level support
  - Performed 39 site assessments since January 2003



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## On-Base Wind Energy Assessment

- Preliminary Conclusions
  - 400 to 900 MW of wind energy generating potential identified
  - 20 installations have good development potential
  - Individual project sizes ranged from 3 MW to 200 MW
  - 20 to 60 MW was a common project size range
  - MANY had small turbine opportunities



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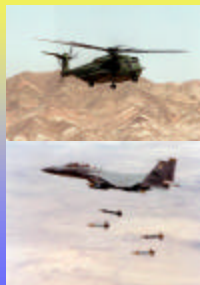
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## On-Base Wind Energy Assessment

- Unique Challenges
  - 150 foot height restrictions at AFBs
  - Military Operations Areas (MOAs) airspace
  - Small off-base DOD parcels for electronic threat emitters
  - Extensive use of available land for training, maneuvers, simulations
  - Large buffer areas around targets



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## On-Base Wind Energy Assessment

- Next Steps...
  - Installation and data collection for up to 20 met towers (spring/summer 2003)
  - 40-m or 50-m met towers with multiple sensors to be used
  - Collect one year of data
  - Utilize wind data in business-case analysis to evaluate economics
  - Evaluate near-base potential in collaboration with purchasing strategies
  - Final report in summer 2004



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## More Information?

- American Wind Energy Association  
[www.awea.org](http://www.awea.org)
- U.S. Department of Energy – Windpowering America  
[www.eere.energy.gov/windpoweringamerica/](http://www.eere.energy.gov/windpoweringamerica/)
- National Renewable Energy Laboratory  
[www.nrel.gov/wind](http://www.nrel.gov/wind)
- National Wind Coordinating Committee  
[www.nationalwind.org](http://www.nationalwind.org)